09/485329

424 Rec'd PCT/PTO 07 FEB 2000

Practitioner's Docket No. U 012599-9

CHAPTER II

TRANSMITTAL LETTER
TO THE UNITED STATES ELECTED OFFICE (EO/US)

(ENTRY INTO U.S. NATIONAL PHASE UNDER CHAPTER II)

PCT/RU98/00251	3 AUGUST 1998	11 AUGUST 1997
INTERNATIONAL APPLICATION NO. CLAIMED	INTERNATIONAL FILING DATE	PRIORITY DATE

DICHROIC POLARIZER
TITLE OF INVENTION

Pavel Ivanovich LAZAREV; Alexandr Alexandrovich MIROSHIN; Nikolai Vladimirovich MALIMONENKO; Sergei Vasilievich BELYAEV
APPLICANT(S)

Box PCT
Assistant Commissioner for Patents
Washington D.C. 20231
ATTENTION: EO/US

NOTE: The completion of those filing requirements that can be made at a time later than 30 months from the priority date results from the Commissioner exercising his judgment under the authority granted under 35 USC 371(d). The filing receipt will show the actual date of receipt of the last item completing the entry into the national phase. See 37 C.F.R. §1.491 which states: "An international application enters the national state when the applicant has filed the documents and fees required by 35 USC 371(c) within the periods set forth in § 1.494 and § 1.495."

CERTIFICATION UNDER 37 C.F.R. 1.10*
*(Express Mail label number is **mandatory**.)*
(Express Mail certification is optional.)

I hereby certify that this correspondence and the documents referred to as attached therein are being deposited with the United States Postal Service on this date FEBRUARY 7, 2000, in an envelope as "Express Mail Post Office to Addressee," Mailing Label Number EL386267372US, addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231.

CONNIE YANNOTTI
(type or print name of person mailing paper)

Signature of person mailing paper

WARNING: *Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.*

****WARNING:*** *Each paper or fee filed by "Express Mail" **must** have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. 1.10(b).*
*"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will **not** be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.*

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WARNING: *Where the items are those which can be submitted to complete the entry of the international application into the national phase are subsequent to 30 months from the priority date the application is still considered to be in the international state and if mailing procedures are utilized to obtain a date the express mail procedure of 37 C.F.R. §1.10 must be used (since international application papers are not covered by an ordinary certificate of mailing - See 37 C.F.R. §1.8.*

NOTE: Documents and fees must be clearly identified as a submission to enter the national state under 35 USC 371 otherwise the submission will be considered as being made under 35 USC 111. 37 C.F.R. § 1.494(f).

1. Applicant herewith submits to the United States Elected Office (EO/US) the following items under 35 U.S.C. 371:

   a. [x] This express request to immediately begin national examination procedures (35 U.S.C. 371(f)).

   b. [x] The U.S. National Fee (35 U.S.C. 371(c)(1)) and other fees (37 C.F.R. § 1.492) as indicated below:

2.Fees

CLAIMS FEE	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
[ ]*	TOTAL CLAIMS	6 - 20 =		x $ 18.00 =	$
	INDEPENDENT CLAIMS	1 - 3 =		x $ 78.00 =	
	MULTIPLE DEPENDENT CLAIM(S) (if applicable) + $260.00				
BASIC FEE**	[ ] U.S. PTO WAS INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where an International preliminary examination fee as set forth in § 1.482 has been paid on the international application to the U.S. PTO: [ ] and the international preliminary examination report states that the criteria of novelty, inventive step (non-obviousness) and industrial activity, as defined in PCT Article 33(2) to (4) have been satisfied for all the claims presented in the application entering the national stage (37 CFR 1.492(a)(4)) ..... $96.00 [ ] and the above requirements are not met (37 CFR 1.492(a)(1)) ..... $670.00 [X] U.S. PTO WAS NOT INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where no international preliminary examination fee as set forth in § 1.482 has been paid to the U.S. PTO, and payment of an international search fee as set forth in § 1.445(a)(2) to the U.S. PTO: [ ] has been paid (37 CFR 1.492(a)(2)) ..... $690.00 [X] has not been paid (37 CFR 1.492(a)(3)) ..... $970.00 [ ] where a search report on the international application has been prepared by the European Patent Office or the Japanese Patent Office (37 CFR 1.492(a)(5)) $840.00				$970.00
	Total of above Calculations				=$970.00
SMALL ENTITY	Reduction by ½ for filing by small entity, if applicable. Affidavit must be filed. (note 37 CFR 1.9, 1.27, 1.28)				-
	Subtotal				
	Total National Fee				$
	Fee for recording the enclosed assignment document $40.00 (37 CFR 1.21(h)). (See Item 13 below). See attached "ASSIGNMENT COVER SHEET".				
TOTAL	Total Fees enclosed				$970.00

*See attached Preliminary Amendment Reducing the Number of Claims.

i. [X] A check in the amount of $970.00 to cover the above fees is enclosed.
ii. [ ] Please charge Account No. _____ in the amount of $ _____.
A duplicate copy of this sheet is enclosed.

**WARNING: *"To avoid abandonment of the application the applicant shall furnish to the United States Patent and Trademark Office not later than the expiration of 30 months from the priority date: * * * (2) the basic national fee (see § 1.492(a)). The 30-month time limit may not be extended." 37 C.F.R. § 1.495(b).*

WARNING: *If the translation of the international application and/or the oath or declaration have not been submitted by the applicant within thirty (30) months from the priority date, such requirements may be met within a time period set by the Office. 37 C.F.R. § 1.495(b)(2). The payment of the surcharge set forth in § 1.492(e) is required as a condition for accepting the oath or declaration later than thirty (30) months after the priority date. The payment of the processing fee set forth in § 1.492(f) is required for acceptance of an English translation later than thirty (30) months after the priority date. Failure to comply with these requirements will result in abandonment of the application. The provisions of § 1.136 apply to the period which is set. Notice of Jan. 3, 1993, 1147 O.G. 29 to 40.*

3. [X] A copy of the International application as filed (35 U.S.C. 371(c)(2)):

NOTE: *Section 1.495 (b) was amended to require that the basic national fee and a copy of the international application must be filed with the Office by 30 months from the priority date to avoid abandonment "The International Bureau normally provides the copy of the international application to the Office in accordance with PCT Article 20. At the same time, the International Bureau notifies applicant of the communication to the Office. In accordance with PCT Rule 47.1, that notice shall be accepted by all designated offices as conclusive evidence that the communication has duly taken place. Thus, if the applicant desires to enter the national stage, the applicant normally need only check to be sure the notice from the International Bureau has been received and then pay the basic national fee by 30 months from the priority date." Notice of Jan. 7, 1993, 1147 O.G. 29 to 40, at 35-36. See item 14c below.*

a. [X] is transmitted herewith.
b. [ ] is not required, as the application was filed with the United States Receiving Office.
c. [ ] has been transmitted
i. [ ] by the International Bureau.
Date of mailing of the application (from form PCT/IB/308): _____.
ii. [ ] by applicant on _____.
Date

4. [X] A translation of the International application into the English language (35 U.S.C. 371(c)(2)):
a. [X] is transmitted herewith.
b. [ ] is not required as the application was filed in English.
c. [ ] was previously transmitted by applicant on _____.
Date
d. [ ] will follow.

5. [X] Amendments to the claims of the International application under PCT Article 19 (35 U.S.C. 371(c)(3)):

NOTE: The Notice of January 7, 1993 points out that 37 C.F.R. § 1.495(a) was amended to clarify the existing and continuing practice that PCT Article 19 amendments must be submitted by 30 months from the priority date and this deadline may not be extended. The Notice further advises that: "The failure to do so will not result in loss of the subject matter of the PCT Article 19 amendments. Applicant may submit that subject matter in a preliminary amendment filed under section 1.121. In many cases, filing an amendment under section 1.121 is preferable since grammatical or idiomatic errors may be corrected." 1147 O.G. 29-40, at 36.

a. [ ] are transmitted herewith.
b. [ ] have been transmitted
   i. [ ] by the International Bureau.
   Date of mailing of the amendment (from form PCT/IB/308): _____.
   ii. [ ] by applicant on _____.
   Date
c. [X] have not been transmitted as
   i. [X] applicant chose not to make amendments under PCT Article 19.
   Date of mailing of Search Report (from form PCT/ISA/210): October 14, 1998.
   ii. [ ] the time limit for the submission of amendments has not yet expired. The amendments or a statement that amendments have not been made will be transmitted before the expiration of the time limit under PCT Rule 46.1.

6. [X] A translation of the amendments to the claims under PCT Article 19 (38 U.S.C. 371(c)(3)):
a. [ ] is transmitted herewith.
b. [ ] is not required as the amendments were made in the English language.
c. [X] has not been transmitted for reasons indicated at point 5(c) above.

7. [X] A copy of the international examination report (PCT/IPEA/409)
[X] is transmitted herewith.
[ ] is not required as the application was filed with the United States Receiving Office.

8. [X] Annex(es) to the international preliminary examination report
a. [X] is/are transmitted herewith.
b. [ ] is/are not required as the application was filed with the United States Receiving Office.

9. [ ] A translation of the annexes to the international preliminary examination report
a. [ ] is transmitted herewith.
b. [ ] is not required as the annexes are in the English language.

10. [X] An oath or declaration of the inventor (35 U.S.C. 371(c)(4)) complying with 35 U.S.C. 115
    a. [ ] was previously submitted by applicant on _____. Date
    b. [ ] is submitted herewith, and such oath or declaration
        i. [ ] is attached to the application.
        ii. [ ] identifies the application and any amendments under PCT Article 19 that were transmitted as stated in points 3(b) or 3(c) and 5(b); and states that they were reviewed by the inventor as required by 37 C.F.R. 1.70.
    c. [X] will follow.

Other document(s) or information included:

11. [X] An International Search Report (PCT/ISA/210) or Declaration under PCT Article 17(2)(a):
    a. [X] is transmitted herewith.
    b. [ ] has been transmitted by the International Bureau.
    Date of mailing (from form PCT/IB/308): _____.
    c. [ ] is not required, as the application was searched by the United States International Searching Authority.
    d. [ ] will be transmitted promptly upon request.
    e. [ ] has been submitted by applicant on _____. Date

12. [X] An Information Disclosure Statement under 37 C.F.R. 1.97 and 1.98:
    a. [X] is transmitted herewith.
    Also transmitted herewith is/are:
    [X] Form PTO-1449 (PTO/SB/08A and 08B).
    [X] Copies of citations listed.
    b. [ ] will be transmitted within THREE MONTHS of the date of submission of requirements under 35 U.S.C. 371(c).
    c. [ ] was previously submitted by applicant on _____. Date

13. [ ] An assignment document is transmitted herewith for recording.

A separate [ ] "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or [ ] FORM PTO 1595 is also attached.

_____
_____
_____

14. [X] Additional documents:
    a. [X] Copy of request (PCT/RO/101)
    b. [X] International Publication No. WO 99/08140
        i. [ ] Specification, claims and drawing
        ii. [X] Front page only
    c. [X] Preliminary amendment (37 C.F.R. § 1.121)
    d. [X] Other

    Form PCT/IPEA/401; Form PCT/IPEA/401; Form PCT/IB/345; Form PCT/IB/306;

15. [X] The above checked items are being transmitted
    a. [X] before 30 months from any claimed priority date.
    b. [ ] after 30 months.

16. [ ] Certain requirements under 35 U.S.C. 371 were previously submitted by the applicant on _____, namely:

AUTHORIZATION TO CHARGE ADDITIONAL FEES

WARNING: *Accurately count claims, especially multiple dependent claims, to avoid unexpected high charges if extra claims are authorized.*

NOTE: "A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).

NOTE: "Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).

[X] The Commissioner is hereby authorized to charge the following additional fees that may be required by this paper and during the entire pendency of this application to Account No. 12-0425.

[X] 37 C.F.R. 1.492(a)(1), (2), (3), and (4) (filing fees)

WARNING: *Because failure to pay the national fee within 30 months without extension (37 C.F.R. § 1.495(b)(2)) results in abandonment of the application, it would be best to always check the above box.*

[ ] 37 C.F.R. 1.492(b), (c) and (d) (presentation of extra claims)

NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must

only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.492(d)), it might be best not to authorize the PTO to charge additional claim fees, except possible when dealing with amendments after final action.

[X] 37 C.F.R. 1.17 (application processing fees)
[X] 37 C.F.R. 1.17(a)(1)-(5)(extension fees pursuant to § 1.136(a).
[X] 37 C.F.R. 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. 1.311(b))

NOTE: *Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).*

NOTE: *37 C.F.R. 1.28(b) requires "Notification of any change in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying . . . issue fee." From the wording of 37 C.F.R. § 1.28(b): (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.*

[X] 37 C.F.R. § 1.492(e) and (f) (surcharge fees for filing the declaration and/or filing an English translation of an International Application later than 30 months after the priority date).

SIGNATURE OF PRACTITIONER

Reg. No.: 25,858

Tel. No.: (212) 708-1930

Customer No.:

William R. Evans
(type or print name of practitioner)
c/o Ladas & Parry
26 West 61st Street
P.O. Address
New York, NY 10023

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

PCT/RU98/00251	3 AUGUST 1998	11 AUGUST 1997
INT'L APPLICATION NO.	INT'L FILING DATE	PRIORITY DATE CLAIMED

DICHROIC POLARIZER
TITLE OF INVENTION

Pavel Ivanovich LAZAREV; Alexandr Alexandrovich MIROSHIN; Nikolai Vladimirovich MALIMONENKO; Sergei Vasilievich BELYAEV
APPLICANT(S)

Attorney Docket: U 012599-9

Commissioner of Patents and Trademarks
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Please amend the above application as follows.

In the Claims

Claim 4, line 1, delete "any of the Claims 1 or 2 or 3" and substitute therefor --claim 1--

Claim 5, line 1, delete "any of the Claims 1 or 2 or 3" and substitute therefor --claim 1--

---

CERTIFICATION UNDER 37 C.F.R. 1.10*
*(Express Mail label number is **mandatory**.)*
(Express Mail certification is optional.)

I hereby certify that this correspondence and the documents referred to as attached therein are being deposited with the United States Postal Service on this date February 7, 2000 in an envelope as "Express Mail Post Office to Addressee," Mailing Label Number EL386267372US, addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231.

CONNIE YANNOTTI
(type or print name of person mailing paper)

Signature of person mailing paper

WARNING: *Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.*

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Claim 6, line 1, delete "any of the Claims 1 or 2 or 3 or 4 or 5" and substitute therefor --claim 1--

Respectfully submitted,

William R. Evans
c/o Ladas & Parry
26 West 61st Street
New York, NY 10023
Reg. No. 25,858 (212) 708-1930

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Pavel Ivanovich LAZAREV, et al.

Serial No.: 09/485,329 Group No.:

Filed: February 7, 2000 Examiner.:

For: DICHROIC POLARIZER

Attorney Docket No.: U 012599-9

Assistant Commissioner for Patents
Washington, D.C. 20231

SECOND PRELIMINARY AMENDMENT

Please amend the above identified application as follows.

IN THE CLAIMS:

Please add the following new claims:

– – 7. The dichroic polarizer of any of the claim 2, wherein at least one coating reflecting electromagnetic radiation, is made of metal.

CERTIFICATE OF MAILING (37 CFR 1.8a)

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to the: Assistant Commissioner of Patents and Trademarks, Washington, D.C. 20231

WILLIAM R. EVANS
(Type or print name of person mailing paper)

Date: February 29, 2000

(Signature of person mailing paper)

8. The dichroic polarizer of any of the claim 3, wherein at least one coating reflecting electromagnetic radiation, is made of metal.

9. The dichroic polarizer of any of the claim 2, wherein at least on coating reflecting electromagnetic radiation is made of multilayer dielectric mirror of the interchanged layers of materials with high and low refraction coefficients.

10. The dichroic polarizer of any of the claim 3, wherein at least one coating reflecting electromagnetic radiation is made of multilayer dielectric mirror of the interchanged layers of materials with high and low refraction coefficients.

11. The dichroic polarizer of any of the claim 2, wherein the layer dichroically absorbing electromagnetic radiation is made of an oriented layer of at least one dichroic dye applied from the lyotropic liquid crystalline state.

12. The dichroic polarizer of any of the claim 3, wherein the layer dichroically absorbing electromagnetic radiation is made of an oriented layer of at least one dichroic dye applied from the lyotropic liquid crystalline state.

13. The dichroic polarizer of any of the claim 4, wherein the layer dichroically absorbing electromagnetic radiation is made of an oriented layer of at least one dichroic dye applied from the lyotropic liquid crystalline state.

14. The dichroic polarizer of any of the claim 5, wherein the layer dichroically absorbing electromagnetic radiation is made of an oriented layer of at least one dichroic dye applied from the lyotropic liquid crystalline state.

15. The dichroic polarizer of any of the claim 7, wherein the layer dichroically absorbing electromagnetic radiation is made of an oriented layer of at least

one dichroic dye applied from the lyotropic liquid crystalline state.

16. The dichroic polarizer of any of the claim 8, wherein the layer dichroically absorbing electromagnetic radiation is made of an oriented layer of at least one dichroic dye applied from the lyotropic liquid crystalline state.

17. The dichroic polarizer of any of the claim 9, wherein the layer dichroically absorbing electromagnetic radiation is made of an oriented layer of at least one dichroic dye applied from the lyotropic liquid crystalline state.

18. The dichroic polarizer of any of the claim 10, wherein the layer dichroically absorbing electromagnetic radiation is made of an oriented layer of at least one dichroic dye applied from the lyotropic liquid crystalline state.

Respectfully submitted,

WILLIAM R. EVANS
LADAS & PARRY
26 WEST 61ST STREET
NEW YORK, NEW YORK 10023
REG.NO.25,858(212)708-1930

3/PRTS

09/485329

430 Rec'd PCT/PTO 07 FEB 2000

Patent Application # 97113673
Filed to RF Patent Office on August 12, 1997
Title: Dichroic Polarizer
Authors: Belyaev S.V., Lazarev P.I., Malimonenko N.A., Miroshin A.V.

G02B 5/30

Dichroic polarizer

The invention belongs to polarizing devices and can be used in lighting equipment, manufacturing construction-material glasses and optical instruments, for example, spectrophotometers and displays.

The action of dichroic polarizers considered within the framework of the proposed invention is based on the property of a number of materials usually termed dichroic, to differently absorb orthogonal linearly-polarized components of electromagnetic radiation. Dichroic film polarizers termed polaroids or polarizing light filters are the most widely applied. To create them, materials containing molecules or particles (for example, microcrystals) are commonly used which, along with strong absorption, have strong dichroism in a wide range of wavelengths. As a rule, these molecules or particles have extended shapes, so orientation of molecules or particles is performed during manufacturing a polarizer in the certain (chosen) direction, also known as the absorption axis. The transmission plane of the polarizer (the polarizer plane) is then located perpendicularly to the absorption axis. The absorption degree of the components depends on orientation of the electrical vector oscillation relative to the chosen direction. When considering the functioning of polarizers, it is convenient to designate the orthogonally polarized components according to the degree of their absorption. Further, the terms absorbed (parasitic) component and non-absorbed (the useful component) will be used.

To estimate the efficiency (quality) of polarizers, including dichroic polarizers, and to compare between them, their polarizing abilities (degree of polarization) are normally used, which are determined using various methods (A.I.Vanyurikhin, V.P.Gerchanovskaya, "Optical polarizing devices", Kiev, Tekhnika, 1984 [1], page 23, in Russian). Further, the degree of polarization will mean the value determined, for a transmissive polarizer, via the energy transmission coefficients T_1 and T_2 for the non-absorbed and the absorbed orthogonally polarized component respectively:

$$P = (T_1 - T_2) / (T_1 + T_2),$$

while, for the reflective polarizer, through the energy-related reflection coefficients R_1 and R_2 for the non-absorbed and the absorbed orthogonally polarized component respectively:

$$P = (R_1 - R_2) / (R_1 + R_2)$$

Dichroic polarizers are known consisting of polymeric films strongly stretched in one direction and containing dichroic molecules, which become oriented during stretching, for example, the iodine-polyvinyl polarizers based on polyvinyl alcohol ([1], pages 37-42). These polarizers are multilayer films including, along with the

polarizing layer, also the reinforcing, gluing, and protecting layers. The basic disadvantage of the specified film polarizers is rather high labor input required for their manufacturing.

The polarizer closest in the technical basis to the one described herein is the dichroic polarizer including a substrate on which a molecularly oriented layer is deposited which has been obtained from organic dye which is in the lyotropic liquid crystal state (application PCT 94/05493, Cl. C09B31/147, 1994). Use of such dyes allows to considerably simplify the technology of manufacturing dichroic polarizers, and to lower their cost accordingly, but the dichroic polarizers thus obtained do not have the sufficient degree of polarization.

The purpose of the invention is to increase the efficiency of a dichroic polarizer at the expense of increasing the polarization degree of electromagnetic radiation, while preserving the high transmission (reflection) coefficient for the non-absorbed component.

The purpose set herein is achieved because, in a dichroic polarizer containing a substrate and a layer of a dichroic material, two reflecting coatings are introduced, at least one of which is made partially transmitting, and the dichroically absorbing layer is located between the two reflecting coatings. Such a multilayer structure allows to obtain multipath interference and resembles the Fabry-Perot interferometer.

The dichroic polarizer can be implementing as a reflective one, and one of the reflecting coatings will in this case be made completely reflecting, while the second will be partially transmitting. Then, the first coating to be deposited from the substrate side may be either the reflecting one (completely reflecting), or the partially transmitting one.

The multipath interference results in obtaining, at the exit of the dichroic polarizer, interference maxima, minima, as well as intermediate intensity values, depending on thicknesses and materials of layers and coatings constituting the polarizer.

Analysis of the influence of interference picture at the exit of the proposed polarizer on the polarization degree of radiation has shown that, when an interference maximum of intensity is obtained, there is an increase in either the energy-related transmission coefficient or, in the other polarizer type (reflective rather than transmissive), the reflection coefficient, for both the absorbed and the non-absorbed components. Thus, the ratio of intensities of the transmitted (or reflected) radiation of the orthogonally polarized components decreases, and the degree of polarization decreases accordingly. Although this increases transmission (reflection) of the polarizer, this is not so important as reduction of the polarization degree.

When an interference minimum is obtained at the exit of a polarizer, the intensity is

reduced of both orthogonally polarized components. However, both the calculations and the experimental data have shown that it is possible to reduce the intensity of the absorbed components more significantly than that of the non-absorbed components. Although this causes some reduction in transmission (reflection) of the polarizer, the degree of polarization substantially increases.

It is therefore relevant that the materials and layer thicknesses of the dichroic polarizer should be chosen from the requirement to obtain, at the polarizer exit, an interference minimum for the absorbed components for at least one wavelength of the electromagnetic radiation.

The wavelength for which an interference minimum should be obtained can be set at, for example, the wavelength corresponding to the middle of the used spectral range.

The width of the used spectral range is then determined from the following considerations.

The condition of obtaining an interference minimum at the exit of a dichroic polarizer can be written as:

$\Delta = m\lambda + \lambda/2$,

where Δ is the difference in the path lengths of two beams reflected from the reflecting coatings when the beams leave the polarizer, m is the order of interference, λ is the light wavelength. With a sufficient degree of accuracy, the interference minimum also appears for the neighboring wavelengths, for which the path length difference Δ differs by no more than 10%. For larger orders of interference (m = 10-50), i.e. when the thickness of the layer dichroically absorbing electromagnetic radiation is large enough, the condition of 10% difference in the path length is satisfied for a very narrow range of wavelengths, so the polarizer can be used only as a narrow-band one. When the order of interference is zero (m = 0), i.e. for small enough thickness of layer dichroically absorbing electromagnetic radiation, this condition is satisfied for a wider wavelength range. For example, if 550 is taken to be the basic wavelength for which the equality (3) is valid, the requirement to obtain an interference minimum will be satisfied for, practically, the entire visible range. Hence, when thickness of the dichroically absorbing layer is comparable to the radiation wavelength, a broadband polarizer can be obtained.

From the theory of interference, it is known that, to obtain an interference minimum, the optical path length difference between interfering beams should be $(\lambda/2+m\lambda)$, which is an odd number of half-waves.

To ensure such path length difference, the thickness of the dichroically absorbing

layer is determined for at least one wavelength from the equality $\lambda/4+ \lambda/2 = \lambda/4(1 + 2m)$.

The outcome of interference is largely influenced by the ratio of amplitude values of the interfering beams. It is known that the minimal intensity value can be obtained when the amplitudes are equal. Therefore, it is relevant to make the amplitude values of the interfering beams for the absorbed components as close as possible to each other, which would provide maximal mutual cancellation of beams of these components. Simultaneously, one should ensure a significant difference between the amplitudes of the interfering beams for the non-absorbed components, which will practically exclude the opportunity for these beams to interfere, i.e. intensities of the non-absorbed components will not be appreciably reduced. If both requirements are satisfied, increase in the polarization degree will be ensured, which is more important than some decrease in transmission (reflection) of the polarizer.

From the above considerations, it is relevant that the thickness h of the dichroically absorbing layer was chosen from the requirement for the following equality to be valid for at least for one wavelength λ:

$$hn = m\lambda + \lambda/4 = (2m + 1)*\lambda/4 \quad ,$$

where n is the is refraction coefficient of the dichroically absorbing layer, and m is an integer,

while the thickness and the material of reflecting coatings are chosen from the requirement to ensure, for the absorbed components, equality or approximate (to within 10-20%) equality of amplitudes for at least two interfering beams for at least one wavelength.

The reflecting coatings can be made either of metal, or manufactured from multilayer dielectric mirrors consisting of alternating layers of materials with high and low refraction coefficients.

The metal coatings are easy enough to deposit, for example, by thermal evaporation in vacuum. But then, light is absorbed in such coatings, which reduces transmission (reflection) of the polarizer. For these coatings, aluminium (Al), silver (Ag), and other metals can be used.

In case of multilayer dielectric mirrors, light is not absorbed in them, but the process of their deposition is rather complex and labor-consuming. For these coatings, TiO_2, MgO, ZnS, ZnSe, or ZrO_2, or polymers can be used as the high refraction coefficient materials. As the low refraction coefficient materials, SiO_2, Al_2O_3, CaF_2, BaF_2, AlN, BN, or polymers can be used.

Patent Application # 97113613
Filed to RF Patent Office on August 12, 1997
Title: Dichroic Polarizer
Authors: Belyaev S.V., Lazarev P.I., Malimonenko N.A., Miroshin A.V.

The following standard methods can be used to deposit reflecting coatings: thermal evaporation in vacuum, deposition in vapor with subsequent thermal processing, magnetronic dispersion, and others.

As a material for manufacturing the dichroically absorbing layer, any dichroically absorbing material can in principle be used, which can be shaped as a layer with the thickness comparable to the wavelength, in particular, equal to $\lambda/4$. However, it is more relevant to use a molecularly oriented organic dye which is in the lyotropic liquid crystalline state, from the following series:

Patent Application # 97113613
Filed to RF Patent Office on August 12, 1997
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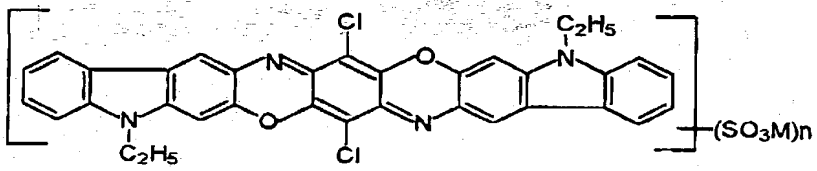
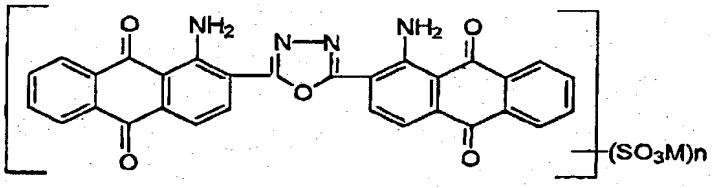
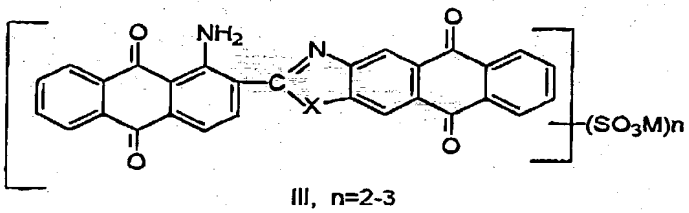
Authors: Belyaev S.V., Lazarev P.I., Malimonenko N.A., Miroshin A.V.



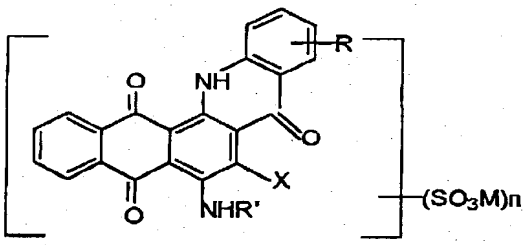
I, n=2-4, M - cation



II, n=2, M - cation

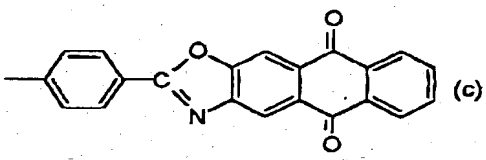


III, n=2-3



IV, R=H, CF_3; X=H, Br, SO_3M; n=1-3;

R' = H (a); CO— —R", R"=H, Cl (b);



Patent Application # 97113613
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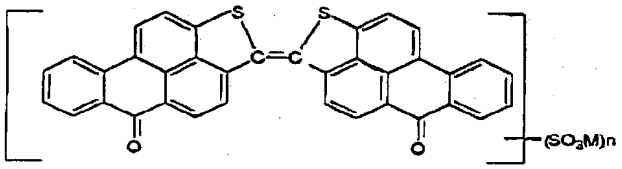
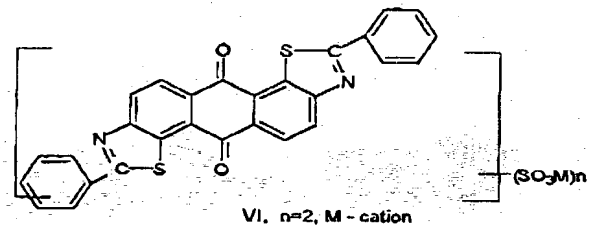
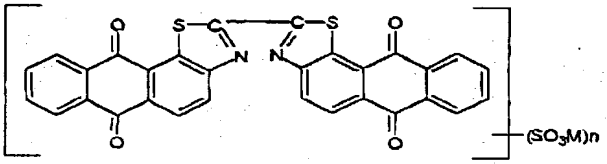


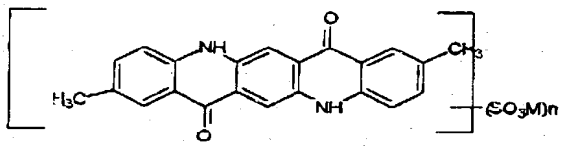
V, n= 2-4, M - cation



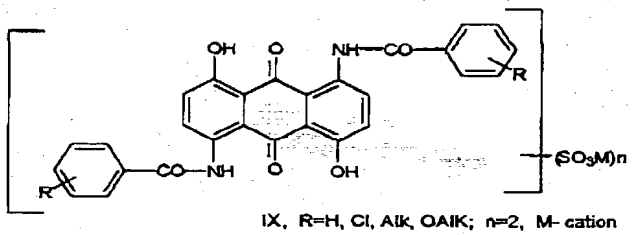
VI, n=2, M - cation



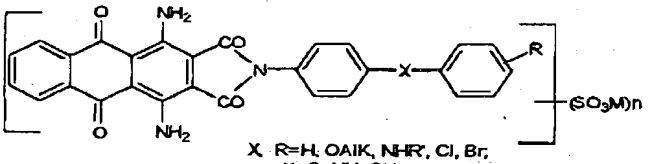
VII, n=2, M - cation



VIII, n=2-3, M - cation



IX, R=H, Cl, Alk, OAlK; n=2, M- cation



X R=H, OAlK, NHR', Cl, Br;
X=O, NH, CH_2; n= 2, M - cation

The specified organic dyes allow to orient the dichroic dye molecules directly during layer deposition. Thus, the technological process of obtaining dichroic polarizers becomes considerably simpler, and, consequently, its cost decreases.

To deposit a layer dichroically absorbing electromagnetic radiation, the following standard methods can be applied: deposition by a platen, by a doctor knife, by a doctor in the form of a non-rotating cylinder, deposition using a slit spinneret or die, etc.

The invention is illustrated by Figs.1-3. In Fig.1, a scheme is shown of a dichroic polarizer according to the prototype. In Fig.2, a scheme of a reflective-type dichroic polarizer is shown according to the invention. In Fig.3, a scheme of a transmitted-light dichroic polarizer according to the invention is shown.

In Fig.1, the scheme of a dichroic polarizer according to the prototype is presented including a layer 1 dichroically absorbing electromagnetic radiation and deposited onto a substrate 2. In the dichroic polarizer according to the prototype, non-polarized electromagnetic radiation 3 passes the layer 1 dichroically absorbing electromagnetic radiation and deposited on the substrate 2, and becomes the linearly polarized electromagnetic radiation 4.

Analysis of properties of the prototype dichroic polarizer has shown that, when the thickness of the layer 1 dichroically absorbing electromagnetic radiation, is 50 nm, for the polarization degree of 80%, transmission of the useful polarized component by the dichroic polarizer is 90%. When the thickness of the layer 1 dichroically absorbing electromagnetic radiation is 500 nm, for the polarization degree of 90%, transmission of the useful polarized component by the dichroic polarizer is 80%. When the thickness of the layer 1 dichroically absorbing electromagnetic radiation is 2000 nm, for the degree polarization of 99%, transmission of the useful polarized component by the dichroic polarizer is 50%.

In Fig.2, a scheme of a dichroic reflective-type polarizer according to the invention is presented including a layer 1 dichroically absorbing electromagnetic radiation, a layer 11 completely reflecting electromagnetic radiation, and a layer 5 partially reflecting electromagnetic radiation. All layers are consecutively deposited onto a substrate 2.

Operation of the proposed dichroic reflective polarizer can be explained as follows. The non-polarized electromagnetic radiation consists of two linearly polarized components 7 and 8, with their polarization planes mutually perpendicular (these two components are conventionally shown apart from each other in Figs. 2 and 3 for better presentation and understanding). The absorbed and not further used component 7, which is polarized parallel to the absorption axis of the layer 1 dichroically absorbing electromagnetic radiation, is partially reflected from the layer

5 partially reflecting electromagnetic radiation, and forms the beam 9. The other part of energy of the component 7 passes through the layer 1 dichroically absorbing electromagnetic radiation, and, after being reflected from the layer 11 completely reflecting electromagnetic radiation, passes the layer 1 once again and then the layer 5 forming the beam 10. The reflected beams 9 and 10 are polarized identically to the initial component 7. The thickness of the layer 1 is chosen so as the optical path length difference between beams 9 and 10 becomes an odd number of half-waves of polarized electromagnetic radiation, where the wavelength corresponds to the middle of the used spectral range. In this case, interference of the beams 9 and 10 results in their mutual weakening, and complete cancellation in the optimum case. Complete mutual cancellation of the beams 9 and 10 is achieved if the intensities (amplitudes) of the beams 9 and 10 have either identical or close values, which can be achieved by optimally selecting reflection coefficients of the reflecting layers 5 and 11. The reflecting layers 5 and 11 can be made of metal, semi-conductor or dielectric, and be either single-layer or multilayer.

The other further used linearly polarized component 8 non-absorbed in the layer 1, which is polarized perpendicularly to the optical axis (absorption axis) of the layer 1, is partially reflected from the layer 5 partially reflecting electromagnetic radiation, and forms the beam 12. The other part of energy of the component 8 passes through the layer 1 dichroically absorbing electromagnetic radiation, and, after being reflected from the layer 11, passes the layer 1 once again and then the layer 5, and forms the beam 13. The reflected beams 12 and 13 are polarized identically to the initial component 8. Interference results in weakening the beams 12 and 13 considerably less than the beams 9 and 10. This is caused by the fact that that their intensities considerably differ because of the negligibly small absorption of the beam 10 in the layer 1.

In Fig.3, the scheme of a dichroic polarizer of a transmissive type according to the invention is presented. The polarizer includes a layer 1 dichroically absorbing electromagnetic radiation and layers 2 and 14 partially reflecting electromagnetic radiation. All layers are deposited onto a substrate 2.

Operation of a dichroic transmissive-type polarizer of electromagnetic radiation according to the invention can be explained as follows. The non-polarized electromagnetic radiation consists of two linearly polarized components 7 and 8, with their polarization planes mutually perpendicular. Both of these components pass through the layer 5 partially reflecting electromagnetic radiation, and then through the layer 1 dichroically absorbing electromagnetic radiation. A part of the energy of the components 7 and 8 passes through a layer 14 partially reflecting electromagnetic radiation, and forms beams 16 and 15 respectively. The other part of energy of the components 7 and 8 is reflected from the layer 14 partially reflecting electromagnetic radiation passes the layer 1, becomes reflected from the

layer 5, once again passes the layers 1 and 14, and forms the beams 17 and 18 respectively. The beams 15 and 18 are polarized identically to the initial component 8, i.e., perpendicularly to the absorption axes. The passed beams 16 and 17 are polarized identically to the initial component 7, i.e., parallel-perpendicular to the absorption axes.

The purpose of this invention is achieved because of unequal reduction of the differently polarized components 3 and 7 of electromagnetic radiation passing through a dichroic polarizer during interference of the parts 4 and 6 of the component 3, as well as parts 8 and 11 of the components 7. This is ensured by specially selecting thicknesses of layer 1, 2 and 5. In particular, the optical thickness of the layer 1 dichroically absorbing electromagnetic radiation should be an integer number of wavelengths of polarized electromagnetic radiation. By changing thicknesses of the layers 2 and 5 partially reflecting electromagnetic radiation, it is possible to select the values of reflection coefficients of these layers optimum for increasing the dichroic polarizer efficiency. A criterion for choosing the reflection coefficients of the layers 2 and 5 can be, for example, the maximal contrast of the dichroic polarizer. The optimum thicknesses of the layers 2 and 5 do not affect the basis of the invention.

The layers 2 and 5 partially reflecting electromagnetic radiation can be made of metal or a multilayer dielectric, which does not affect the basis of the invention.

Examples of specific embodiments of the dichroic polarizer are given below.

Example 1.

A dichroic polarizer of the reflective type according to the invention (Fig.2) for polarization in the visible (light) wavelength range, i.e. for the wavelengths band of 400-700 nm, is made as follows. On a glass substrate, the following layers are consecutively deposited: an aluminium, strongly reflecting layer of 100 nm thickness (deposited using thermal evaporation in vacuum); then a 50 nm thick layer dichroically absorbing electromagnetic radiation made of a mixture of dyes..... of Formulas I.2.3; and then a 2 nm thick aluminium layer partially reflecting electromagnetic radiation.

Measurements have shown the polarizing ability in the dichroic polarizer thus manufactured to be 92%, the reflection of the useful polarized component by the dichroic polarizer being 90%. A similar polarizing parameter in the prototype deposited onto a mirror was 80% for the same dyes and with the same thickness, and reflection of the useful polarized component by the dichroic polarizer was 90%.

Example 2.

A dichroic reflective-type electromagnetic radiation polarizer (Fig.2) polarizing in the

visible (light) wavelength range is manufactured as follows. A strongly reflecting layer with 98% reflection coefficient in the 490-510 nm wavelength range is deposited onto a glass plate as a multilayer dielectric coating. This coating is made of alternating MgF_2 and cryolite layers. On top of this strongly reflecting layer, a 120 nm thick layer is deposited which dichroically absorbs electromagnetic radiation and is made of oriented dye of Formula II. Then, a layer is deposited partially reflecting electromagnetic radiation, with reflection coefficient of 28%, also made of MgF_2 and cryolite layers.

Measurements have shown the polarizing ability in the dichroic polarizer thus manufactured to be 95% in the 490-510 nm wavelength range, the reflection of the useful polarized component by the dichroic polarizer being 90%. The polarizing ability in the prototype deposited onto a mirror was 85%, the reflection of the useful polarized component by the dichroic polarizer being 90%.

Example 3.

A dichroic transmitted-light electromagnetic radiation polarizer (Fig.3) polarizing in the wavelength region of 620-640 nm is manufactured as follows. A 20 nm thick, partially reflecting aluminium layer is deposited onto a glass plate (deposition using thermal evaporation in vacuum). Then a 140 nm thick layer dichroically absorbing electromagnetic radiation made of oriented dye of Formula IV is deposited. Finally, the second 20 nm thick aluminium layer partially reflecting electromagnetic radiation is deposited.

Measurements have shown the polarizing ability in the dichroic polarizer thus manufactured to be 98%, the reflection of the useful polarized component by the dichroic polarizer being 80%. The polarizing ability in the prototype was 86%, with 82% transmission of the useful polarized component by the dichroic polarizer.

Example 4.

A dichroic transmitted-light electromagnetic radiation polarizer according to the invention (Fig.3) polarizing in the near infra-red wavelength range is manufactured as follows. A layer partially reflecting in the 700-1200 nm wavelength range having the reflection coefficient of 40-55% is deposited onto a glass plate as a multilayer dielectric coating made of layers of zinc sulfite and ammonium phosphate. On top of this strongly reflecting layer, a 180 nm thick layer dichroically absorbing electromagnetic radiation made of oriented dye of Formula X is deposited, and then a layer partially reflecting electromagnetic radiation with the reflection coefficient of 28%, also made of layers of zinc sulfite and ammonium phosphate.

Measurements have shown the polarizing ability in the manufactured dichroic

polarizer to be 92% in the wavelength range of 700-1200 nm, the reflection of the useful polarized component by the dichroic polarizer being 80%.

The polarizing ability of the prototype was 75%, with 80% reflection of the useful polarized components by the dichroic polarizer.

Thus all the examples demonstrate the enhancement of the dichroic polarizer efficiency due to the increasing of the polarization degree of the electromagnetic radiation admitted and with the same value of the transmittance (reflectance) coefficient for the non-absorbed component.

Patent Application # 97113613
Filed to RF Patent Office on August 12, 1997
Title: Dichroic Polarizer
Authors: Belyaev S.V., Lazarev P.I., Malimonenko N.A., Miroshin A.V.

Claims

1. A dichroic polarizer including a substrate and a layer dichroically absorbing electromagnetic radiation, wherein two reflecting coatings are introduced, at least one of which being partially transmitting, with the layer dichroically absorbing electromagnetic radiation located between the two reflecting coatings.

2. A dichroic polarizer of Claim 1, wherein both reflecting coatings are made partially transmitting.

3. The dichroic polarizer of Claim 1, wherein materials and thicknesses of the layers dichroically absorbing electromagnetic radiation as well as the reflecting coatings are chosen from the requirement to obtain, at the exit of the dichroic polarizer, an interference minimum for the absorbing component of electromagnetic radiation for, at least, one wavelength value.

4. The dichroic polarizer of any of the Claims 1 or 2 or 3, wherein at least one coating reflecting electromagnetic radiation is made of metal.

5. The dichroic polarizer of any of the Claims 1 or 2 or 3, wherein at least one coating reflecting electromagnetic radiation is made of multilayer dielectric mirror of the interchanged layers of materials with high and low refraction coefficients.

6. The dichroic polarizer of any of the Claims 1 or 2 or 3 or 4 or 5, wherein the layer dichroically absorbing electromagnetic radiation is made of an oriented layer of at least one dichroic dye applied from the lyotropic liquid crystalline state.

Patent Application # 97113633
Filed to RF Patent Office on August 12, 1997
Title: Dichroic Polarizer
Authors: Belyaev S.V., Lazarev P.I., Malimonenko N.A., Miroshin A.V.

1. A.I.Vanyurikhin, V.P.Gerchanovskaya, "Optical polarizing devices", Kiev, Tekhnika, 1984, in Russian

2. PCT 94/05493, Cl. C09B31/147, 1994

3. PCT WO 94/28073, December 8 1994

ABSTRACT

The invention belongs to polarizing devices and can be used in lighting equipment, manufacturing construction-material glasses, and in displays.

The proposed dichroic polarizer includes a substrate and at least one layer dichroically absorbing electromagnetic radiation, into which two reflecting coatings are introduced, at least one of which is made partially transmitting. The layer dichroically absorbing electromagnetic radiation is located between the reflecting coatings. The materials and thicknesses of layers of both the dichroically absorbing electromagnetic radiation and the reflecting coatings are selected from the requirements to obtain, at the exit of the dichroic polarizer, an interference minimum for the absorbing component of electromagnetic radiation for, at least, one wavelength value.

The invention leads to increasing efficiency of dichroic polarizers at the expense of increasing degree of polarization of electromagnetic radiation leaving the polarizer, while high transmission (reflection) coefficient for the non-absorbed component is preserved. 5 formulas, 3 illustrations.

09485329 072902

Practitioner's Docket No. U 012599-9 ***PATENT***

COMBINED DECLARATION AND POWER OF ATTORNEY

(ORIGINAL, DESIGN, NATIONAL STAGE OF PCT, SUPPLEMENTAL, DIVISIONAL, CONTINUATION, OR C-I-P)

As a below named inventor, I hereby declare that:

TYPE OF DECLARATION

This declaration is of the following type:

(check one applicable item below)

[x] original.
[ ] design.
[ ] supplemental.

NOTE: If the declaration is for an International Application being filed as a divisional, continuation or continuation-in-part application, do not check next item; check appropriate one of last three items.

[x] national stage of PCT.

NOTE: If one of the following 3 items apply, then complete and also attach ADDED PAGES FOR DIVISIONAL, CONTINUATION OR C-I-P.

NOTE: See 37 C.F.R. § 1.63(d) (continued prosecution application) for use of a prior nonprovisional application declaration in the continuation or divisional application being filed on behalf of the same or fewer of the inventors named in the prior application.

[ ] divisional.
[ ] continuation.

NOTE: Where an application discloses and claims subject matter not disclosed in the prior application, or a continuation or divisional application names an inventor not named in the prior application, a continuation-in-part application must be filed under 37 C.F.R. § 1.53(b) (application filing requirements-nonprovisional application).

[ ] continuation-in-part (C-I-P).

INVENTORSHIP IDENTIFICATION

WARNING: *If the inventors are each not the inventors of all the claims, an explanation of the facts, including the ownership of all the claims at the time the last claimed invention was made, should be submitted.*

My residence, post office address and citizenship are as stated below, next to my name. I believe that I am the original, first and sole inventor *(if only one name is listed below)* or an original, first and joint inventor *(if plural names are listed below)* of the subject matter that is claimed, and for which a patent is sought on the invention entitled:

TITLE OF INVENTION

DICHROIC PALARISER

SPECIFICATION IDENTIFICATION

The specification of which:

(complete (a), (b), or (c))

(a) [ ] is attached hereto.

NOTE: *"The following combinations of information supplied in an oath or declaration filed on the application filing date with a specification are acceptable as minimums for identifying a specification and compliance with any one of the items below will be accepted as complying with the identification requirement of 37 C.F.R. § 1.63:*

"(1) name of inventor(s), and reference to an attached specification which is both attached to the oath or declaration at the time of execution and submitted with the oath or declaration on filing;

"(2) name of inventor(s), and attorney docket number which was on the specification as filed; or

"(3) name of inventor(s), and title which was on the specification as filed."

Notice of July 13, 1995 (1177 O.G. 60).

(b) [ ] was filed on _____, [ ] as Application No. _____
[ ] and was amended on _____ *(if applicable).*

NOTE: *Amendments filed after the original papers are deposited with the PTO that contain new matter are not accorded a filing date by being referred to in the declaration. Accordingly, the amendments involved are those filed with the application papers or, in the case of a supplemental declaration, are those amendments claiming matter not encompassed in the original statement of invention or claims. See 37 C.F.R. § 1.67.*

NOTE: *"The following combinations of information supplied in an oath or declaration filed after the filing date are acceptable as minimums for identifying a specification and compliance with any one of the items below will be accepted as complying with the identification requirement of 37 C.F.R. § 1.63:*

"(1) name of inventor(s), and application number (consisting of the series code and the serial number; e.g.,08/123,456);

"(2) name of inventor(s), serial number and filing date;

"(3) name of inventor(s) and attorney docket number which was on the specification as filed;

"(4) name of inventor(s), title which was on the specification as filed and filing date;

"(5) name of inventor(s), title which was on the specification as filed and reference to an attached specification which is both attached to the oath or declaration at the time of execution and submitted with the oath or declaration; or

"(6) name of inventor(s), title which was on the specification as filed and accompanied by a cover letter accurately identifying the application for which it was intended by either the application number (consisting of the series code and the serial number; e.g.,08/123,456), or serial number and filing date. Absent any statement(s) to the contrary, it will be presumed that the application filed in the PTO is the application which the inventor(s) executed by signing the oath or declaration."

Notice of July 13, 1995 (1177 O.G. 60), M.P.E.P. § 601(a), 6th ed., rev.3.

(c) [x] was described and claimed in PCT International Application No. RU 98/00251 filed on 03.08.1998 and as amended under PCT Article 19 on _____ *(if any)*.

SUPPLEMENTAL DECLARATION (37 C.F.R. § 1.67(b))

(complete the following where a supplemental declaration is being submitted)

[ ] I hereby declare that the subject matter of the

[ ] attached amendment
[ ] amendment filed on _____.

was part of my/our invention and was invented before the filing date of the original application, above identified, for such invention.

ACKNOWLEDGMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR

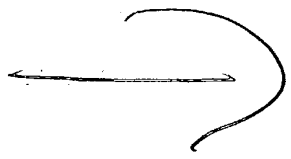
I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information, which is material to patentability as defined in 37, Code of Federal Regulations, § 1.56,

(also check the following items, if desired)

[ ] and which is material to the examination of this application, namely, information where there is a substantial likelihood that a reasonable Examiner would consider it important in deciding whether to allow the application to issue as a patent, and

[ ] in compliance with this duty, there is attached an information disclosure statement, in accordance with 37 C.F.R. § 1.98.



PRIORITY CLAIM (35 U.S.C. § 119(a)-(d))

NOTE: "The claim to priority need be in no special form and may be made by the attorney or agent if the foreign application is referred to in the oath or declaration as required by § 1.63. The claim for priority and the certified copy of the foreign application specified in 35 U.S.C. § 119(b) must be filed in the case of an interference (§ 1.630), when necessary to overcome the date of a reference relied upon by the examiner, when specifically required by the examiner, and in all other situations, before the patent is granted. If the claim for priority or the certified copy of the foreign application is filed after the date the issue fee is paid, it must be accompanied by a petition requesting entry and by the fee set forth in § 1.17(i). If the certified copy is not in the English language, a translation need not be filed except in the case of interference; or when necessary to overcome the date of a reference relied upon by the examiner; or when specifically required by the examiner, in which event an English language translation must be filed together with a statement that the translation of the certified copy is accurate." 37 C.F.R. § 1.55(a).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119(a)-(d) of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

(complete (d) or (e))

(d) [ ] no such applications have been filed.
(e) [x] such applications have been filed as follows.

NOTE: Where item (c) is entered above and the International Application which designated the U.S. itself claimed priority check item (e), enter the details below and make the priority claim.

PRIOR FOREIGN/PCT APPLICATION(S) FILED WITHIN 12 MONTHS (6 MONTHS FOR DESIGN) PRIOR TO THIS APPLICATION AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. § 119(a)-(d)

COUNTRY (OR INDICATE IF PCT)	APPLICATION NUMBER	DATE OF FILING DAY, MONTH, YEAR	PRIORITY CLAIMED UNDER 35 USC 119
Russia	97113613	11.08.97	[x] YES [ ] NO
			[ ] YES [ ] NO
			[ ] YES [ ] NO
			[ ] YES [ ] NO
			[ ] YES [ ] NO

CLAIM FOR BENEFIT OF PRIOR U.S. PROVISIONAL APPLICATION(S)
(35 U.S.C. § 119(e))

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below:

PROVISIONAL APPLICATION NUMBER	FILING DATE
_____ / _____	_____
_____ / _____	_____
_____ / _____	_____

CLAIM FOR BENEFIT OF EARLIER U.S./PCT APPLICATION(S) UNDER 35 U.S.C. § 120

[ ] The claim for the benefit of any such applications are set forth in the attached ADDED PAGES TO COMBINED DECLARATION AND POWER OF ATTORNEY FOR DIVISIONAL, CONTINUATION OR CONTINUATION-IN-PART (C-I-P) APPLICATION.

ALL FOREIGN APPLICATION(S), *IF ANY,* FILED MORE THAN 12 MONTHS (6 MONTHS FOR DESIGN) PRIOR TO THIS U.S. APPLICATION

_____

_____

_____

NOTE: If the application filed more than 12 months from the filing date of this application is a PCT filing forming the basis for this application entering the United States as (1) the national stage, or (2) a continuation, divisional, or continuation-in-part, then also complete ADDED PAGES TO COMBINED DECLARATION AND POWER OF ATTORNEY FOR DIVISIONAL, CONTINUATION OR C-I-P APPLICATION for benefit of the prior U.S. or PCT application(s) under 35 U.S.C. § 120.

POWER OF ATTORNEY

I hereby appoint the following practitioner(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

(list name and registration number)

JOSEPH H. HANDELMAN, 26179
JOHN RICHARDS, 31053
RICHARD J. STREIT, 25765
PETER D. GALLOWAY, 27885
IAN C. BAILLIE, 24090
THOMAS F. PETERSON, 24790

RICHARD P. BERG, 28145
JULIAN H. COHEN, 20302
WILLIAM R. EVANS, 25858
JANET I. CORD, 33778
CLIFFORD J. MASS, 30086
CYNTHIA R. MILLER, 34678

(Check the following item, if applicable)

[ ] I hereby appoint the practitioner(s) associated with the Customer Number provided below to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith.

[ ] Attached, as part of this declaration and power of attorney, is the authorization of the above-named practitioner(s) to accept and follow instructions from my representative(s).

SEND CORRESPONDENCE TO

Ladas & Parry
26 West 61st Street
New York, N.Y. 10023

DIRECT TELEPHONE CALLS TO:
(Name and telephone number)

DECLARATION

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

SIGNATURE(S)

NOTE: Carefully indicate the family (or last) name, as it should appear on the filing receipt and all other documents.

1-00 **Full name of sole or first inventor**

Pavel (GIVEN NAME) Ivanovich (MIDDLE INITIAL OR NAME) LAZAREV (FAMILY (OR LAST) NAME)

Inventor's signature Павел Иванович Лазарев

Date 2.02.2000 Country of Citizenship Russia

Residence Moscow, Russia RU

Post Office Address Russia, Moscow, ulitsa Novoorlovskaya, d.12, kv.160

Full name of second joint inventor, if any

Alexandr (GIVEN NAME) Alexandrovich (MIDDLE INITIAL OR NAME) MIROSHIN (FAMILY (OR LAST NAME))

Inventor's signature _____

Date _____ Country of Citizenship Russia

Residence Moscow, Russia

Post Office Address Russia, Moscow, ulitsa Petrozavodskaya, d.17, korpus 2, kv.152

Full name of third joint inventor, if any

Nikolai (GIVEN NAME) Vladimirovich (MIDDLE INITIAL OR NAME) MALIMONENKO (FAMILY (OR LAST NAME))

Inventor's signature _____

Date _____ Country of Citizenship Russia

Residence Russia, Moskovskaya oblast, Lobnya

Post Office Address Russia, Moskovskaya oblast, Lobnya, ulitsa Lenina, d.6, korpus 3, kv.18

09485329 .072902

SIGNATURE(S)

NOTE: Carefully indicate the family (or last) name, as it should appear on the filing receipt and all other documents.

Full name of sole or first inventor

Pavel Ivanovich LAZAREV

(GIVEN NAME) *(MIDDLE INITIAL OR **NAME**)* *(FAMILY OR LAST NAME)*

Inventor's signature _____

Date _____ Country of Citizenship: Russia

Residence Moscow, Russia

Post *Office* Address Russia, Moscow, ulitsa Novoorlovskava ,d.l2 . kv. 160

Full name of second joint inventor, if any

2.00

Alexandr Alexandrovich MIROSHIN

(GIVEN NAME) *(MIDDLE INITIAL OR NAME)* *FAMILY (OR LAST NAME)*

Inventor's signature. _____

Date July 22, 2002 Country of Citizenship Russia

Residence Moscow, Russia RUX

Post Office Address Russia, Moscow. ulitsa Petrozavodskaya ,d. 17, korpus 2 kv.152

3.00

Full name of third joint inventor, if any

Nikolai Vladimirovich MALIMONENKO

(GIVEH NAME) *(MIDDLE INITIAL CR NAME)* *FAMILY (OR LAST NAME)*

Inventor's signature _____

Date July 4, 2002 - Country of Cirtizenship: Russia

Residence Russia .Moskovskaya oblast, Lobnya RUX

Post Office Address Russia, Moskovskaya oblast, Lobnya .ulitsa Lenina,d.6, korpus 3, kv.18

for Application No 09/485,39 (PCT RU 98/00251)

"Dichroic Polarizer"

Attorney's Docket No. U 012599-9

ADDED PAGE TO COMBINED DECLARATION AND POWER OF ATTORNEY FOR SIGNATURE BY FOURTH INVENTOR

Full name of fourth joint inventor, if any

4th

Sergei Vasilievich BELYAEV

(GIVEN NAME) *(MIDDLE INITIAL OR NAME)* *(FAMILY OR LAST NAME)*

Inventor's signature

Date July 4, 2002 Country of Citizenship Russia

Residence Moskovskaya obl., Russia

Post Office Address pr-t Patsaeva, 14-7726, q.Dolgoprudny
Moskovskaya obl., 141700, Russian Federation

for Application No 09/485,39 (PCT RU 98/00251)
"Dichroic Polarizer"

(Added Page to Combined Declaration and Power of Attorney for Signature by Fourth and Subsequent inventors [1-2])

09485329.072902 #4

Practitioner's Docket No. U 012599-9 ***PATENT***

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

[ ] In re application of: Pavel Ivanovich LAZAREV et al.
Application No.: PCT/RU98/00251 Group No.:
Filed: August 3, 1998 Examiner:
For: DICHROIC PALARIZER

[ ] *Patent No.: Issue Date:

**NOTE: Insert name(s) of inventor(s) and title also for patent Where statement is with respect to a maintenance fee payment, also insert application number and filing date, and add Box M. Fee to address.*

STATEMENT CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(c-f) and 1.27(b-d))

With respect to the invention described in
[ ] the specification filed herewith.
[ ] application no. _____, filed _____.
[ ] patent no. _____ issued _____.

I. IDENTIFICATION AND RIGHTS AS A SMALL ENTITY

I hereby state that I am

(complete either (a), (b), (c) or (d) below)

(a) Independent Inventor
[ ] a below named independent inventor, and that I qualify as an independent inventor, as defined in 37 CFR 1.9(c), for purposes of paying reduced fees under Sections 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office.

(b) Noninventor Supporting a Claim by Another
[ ] making this statement to support a claim by

_____

for a small entity status for purposes of paying reduced fees under Sections 41(a) and (b) of Title 35, United States Code. I hereby state that I would qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under Sections 41(a) and (b) of Title 35, United States Code, if I had made the above identified invention.

(c) Small Business Concern
[ ] the owner of the small business concern identified below:
[x] an official of the small business concern empowered to act on behalf of the concern identified below:

Name of Concern OPTIVA, INC.
Address of Concern 1670 South Amphlett Blvd., Suite 214, San Mateo, CA 94402, USA and

that the above identified small business concern qualifies as a small business concern, as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under Sections 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

(d) Non-Profit Organization

[ ] an official empowered to act on behalf of the nonprofit organization identified below:

Name of Organization _____
Address of Organization _____

TYPE OF ORGANIZATION

[ ] University or Other Institution of Higher Education

[ ] Tax Exempt Under Internal Revenue Service Code (26 USC 501(a) and 501(c) (3))

[ ] Nonprofit Scientific or Educational Under Statute of State of the United States of America
(Name of State_____)
(Citation of Statute_____)

[ ] Would Qualify as Tax Exempt Under Internal Revenue Service Code (26 USC 501(a) and 501(c) (3)), if Located in the United States of America

[ ] Would Qualify as Nonprofit Scientific or Educational Under Statute of State of the United States of America, if Located in the United States of America
(Name of State_____)
(Citation of Statute_____)

and that the nonprofit organization identified above qualifies as a nonprofit organization, as defined in 37 CFR 1.9(e), for purposes of paying reduced fees under Sections 41(a) and (b) of Title 35, United States Code.

II. OWNERSHIP OF INVENTION BY DECLARANT

I hereby state that rights under contract or law remain with and/or have been conveyed to the above identified

[ ] person	[x] concern	[ ] organization
(item (a) or (b) above)	(item (c) above)	(item (d) above)

EXCEPT, that if the rights held are not exclusive, each individual, concern or organization having rights to the invention is listed below* and no rights to the invention are held (1) by any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, (2) any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or (3) a nonprofit organization under 37 CFR 1.9(e).

[x] no such person, concern, or organization
[ ] person, concerns or organizations listed below*

*NOTE: *Separate statements are required from each named person, concern or organization having rights to the invention as to their status as small entities. (37 CFR 1.27)*

Full Name _____
Address _____
[ ] INDIVIDUAL [ ] SMALL BUSINESS CONCERN [ ] NONPROFIT ORGANIZATION

Full Name _____
Address _____
[ ] INDIVIDUAL [ ] SMALL BUSINESS CONCERN [ ] NONPROFIT ORGANIZATION

III. ACKNOWLEDGEMENT OF DUTY TO NOTIFY PTO OF STATUS CHANGE

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

IV. DECLARATION

(check the following item, if desired)

NOTE: *The following verification statement need not be made in accordance with the rules published on October 10, 1997, 62 Fed. Reg. 52131, effective December 1, 1997.*

NOTE: *"The presentation to the Office (whether by signing, filing, submitting, or later advocating) of any paper by a party, whether a practitioner or non-practitioner, constitutes a certification under § 10.18(b) of this chapter. Violations of § 10.18(b)(2) of this chapter by a party, whether a practitioner or non-practitioner, may result in the imposition of sanctions under § 10.18(c) of this chapter. Any practitioner violating § 10.18(b) may also be subject to disciplinary action. See §§ 10.18(d) and 10.23(c)(15)." 37 CFR 1.4(d)(2).*

[ ] I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

V. SIGNATURES

(complete only (e) or (f) below)

(e)
NOTE: All inventors must sign the statement.

_____
Name of Inventor

_____ Date: _____
Signature of Inventor

_____
Name of Inventor

_____ Date: _____
Signature of Inventor

_____
Name of Inventor

_____ Date: _____
Signature of Inventor

(add lines for any additional inventors who must sign)

or

(f)
NOTE: The title of the person signing on behalf of a concern or nonprofit organization should be specified.

Name of Person Signing LAZAREV Pavel Ivanovich

Title of Person Chaiman of Board of Directors
(if signing on behalf of a concern or non-profit organization)

Address of Person Signing ul.Novoorlovskaya, d.12, kv.160, Moscow, 119633, Russian Federation

SIGNATURE _____ DATE 01.02.2000